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ABSTRACT

This discussion addresses several nutrition issues considered important to schools, students, and educators in the United States. Contents consist of a review of malnutrition and learning research and discussions of food additives and allergies, diet and hyperkinesia, the effects of caffeine and sugar on children's behavior, and the National School Food Service Program. (RH)

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Student Nutrition, Learning and Behavior

by

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"Student Nutrition, Learning and Behavior"

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ABSTRACT

Research has shown hungry children to exhibit behavior changes which may limit their responses to learning opportunities. Chronic undernutrition may impair intellectual development.

A review of literature on the relationship between nutrition and learning will be presented with emphasis on topic areas such as: "factors affecting food intake in the school age child," "food additives and allergies," "diet and hyperkinesia" and "sugar and behavior." There will also be some discussion regarding the current status of nutrition in Virginia's public schools.

Practitioners working in the field of nutrition will testify to the belief that children's behavior while in a clinical setting, their alertness and level of interest, correlate well with other things going on in the home, including the diet that the family consumes. And while many children seen for nutrition counselling are of a lower socioeconomic status, it would be erroneous to conclude that only people at or below the poverty level suffer from poor nutrition and hence are susceptible to underdevelopment physically and mentally.

Food consumption studies in the past two decades have shown quite conclusively that huge numbers of Americans have diets that do not meet recommended levels of all nutrients. How do varying degrees of malnutrition, whether it involves one or all nutrients, effect our behavior? And more specifically how does nutritional status effect the behavior and learning of students in our schools?

Right now this is a question that has not yet been resolved, for in any type of behavioral research it's difficult to find a causal, clearcut relationship. To cover a topic area of this magnitude in an hour discussion is impossible, but I will try to address several

issues of concern in our schools today, issues which may well be misrepresented by the popular press and "misinformed nutrition advocates".

Specific topic areas are as follows:

1. Review of Malnutrition and Learning Research
2. Food Additives and Allergies
3. Diet and Hyperkinesia
4. Sugar
5. Caffeine
6. Virginia School Food Service. . . What's Happening?

Malnutrition is defined as "the state of impaired functional ability or development caused by inadequate intake of nutrients and/or calories for long term needs". Generally it results in "symptoms" or "conditions".¹ Malnutrition may be severe (i.e. Kwashiakor, Marasmus) or more moderate.

Moderate malnutrition or chronic undernutrition afflicts a large number of the world's children and although not life threatening, does make the child more susceptible to disease states and infections. Malnutrition requires prolonged rehabilitation and may leave lasting effects.

Hunger is defined as the "psychologic and physiologic state resulting when there is insufficient food to meet immediate energy needs".¹ It is easily and immediately relieved with food. Most of the data on malnutrition and mental development came from studies using severe dietary restriction in animals, who show significant reductions in brain size and the number of brain cells. Autopsies of children who died from malnutrition show similar results.

Some studies in underdeveloped countries have shown that there may be selective effects of severe malnutrition on behavioral functions. Studies have shown significant impairment in the level of attention to novel stimuli, poor performance on tasks requiring a high level of sustained attention and reading, spelling and arithmetic skills.² In some

animal studies learning capacity was not significantly reduced, but curiosity was diminished.³

Compared with severe malnutrition, there are fewer studies on moderate malnutrition or chronic undernutrition. Nearly all studies of this nature have been retrospective with most conclusions inferred from anthropometric studies and dietary assessment. While some investigations in underdeveloped countries do show correlations in intellectual performance, social-environmental differences and differences in school participation cloud interpretations of results.¹

Anemia

Most nutrition problems identified in the United States are identified as "dietary subnutrition", much less severe than in underdeveloped countries. Anemia, by far, is the most prevalent problem of young children; in the United States incidence figures for children are as high as 20%. Statistics are even higher in lower socioeconomic groups.⁴ Anemia has been associated with a marked decrease in attentiveness, less complex or purposeful activity, narrower attention span, decreased persistence and a decrease in voluntary activity.¹

As with many other nutrition problems, several target groups are at particular risk of anemia. These include infants, children, females in their child bearing age and adults. One reason children are so susceptible to problems is because of their more rapid rate of growth. Also, iron in foods is not always readily available for use in the body. A varied diet only contributes an average of 6 mg/1000 calories. When this iron intake is compared to the requirements (school age children need 4 - 10 mg/day; adolescents require 10 - 20 mg/day)⁴ one can see how difficult it is to get iron from an average diet. To get an adequate intake of iron at any age it is imperative to select those foods that are richest in iron. These foods include liver and other organ meats, lean meats, dried fruits, whole grain cereals, dark green leafy vegetables, legumes and peanut butter. For the best absorption of iron by the body a good source of vitamin C is also recommended.

To move on to areas that have recently gained popular press one can ask the question . . . What bearing might different components of food have on behavior in children, more specifically on hyperactivity?

With statistics on hyperactivity ranging from 5 - 10% of young school age children the thinking on hyperactivity has periodically become simplistic in the search for a cause and a cure. School personnel are particularly sensitized to hyperactive children because of the difficulties of managing them in a classroom setting. When diet was pegged as a "cause" for hyperactivity and a modified diet as a "cure" parents and school personnel were ready for a new solution to the age old problem.

In the 1970's Dr. Benjamin F. Feingold, then the chief allergy specialist at the Kaiser-Permanente Health Care Program in San Francisco made popular a theory that many children are sensitive to the artificial colors and flavors in foods, especially those related to aspirin (salicylates) and when fed a diet of natural foods, free of these compounds 50% respond by calming down. By 1978 more than 20,000 children were being fed the Feingold diet.⁵

And Feingold was claiming that not only hyperactivity but other conditions, as well, may respond to his diet. These conditions included seizures, retardation, autism, Down's Syndrome, bedwetting, Serous Otitis (recurrent fluid in the ear) and eye muscle coordination.⁶

An examination of the components of the Feingold diet shows that in order to follow this diet, most people would have to make drastic alterations in their typical food patterns and spend a good deal of time in preparation.

Are these theories justified?

A good way of exploring the hypothesis regarding diet and hyperactivity is to explore it from different angles:

1. Do any food additives cause adverse effects in children?

and

2. Does an additive free diet relieve symptoms in hyperactive children?

The answer to the first question is yes. Food additives have been shown to cause adverse reactions in some people.

Probably the best known reaction is to MSG or monosodium glutamate (commonly found as "Accent"). People sensitive to this substance may experience a variety of symptoms including numbness of the back of the neck, arms and back, weakness, palpitations and "shudders" which can resemble epileptic seizures. This is popularly known as the "Chinese Restaurant Syndrome" since it is traditionally used in Oriental cooking.⁷ According to some, "the more people who become familiar with this syndrome, the more people who get it."

Food allergies can cause adverse reactions in sensitive persons. Symptoms include hyperkinesia (excessive activity), irritability and lack of attention. Allergies are caused by the tendency of a child's body to produce antibodies against specific proteins found in foods. The worst offenders of this kind are milk, wheat and eggs. Infrequently, cane sugar can also cause an allergic reaction, possibly the root of rumors that sugar causes hyperactivity. Reactions of this type can be of permanent nature or just a transient condition.

At least one specific food coloring allergy is known. Yellow dye number 5, tartrazine, which is a salicylate, has been shown to cause allergic reactions, especially in those allergic to aspirin. (This was how Feingold originally came up with his diet list.) However, it is a distinct individual reaction and probably accounts for less than 1% of those children who are considered hyperactive.⁵

To diagnose a food allergy, the culprit must be eliminated to see if symptoms disappear. The key is to secretly reintroduce foods to see if symptoms reappear.

Food allergies are often misdiagnosed and are much less common than people believe them to be. But in those sensitive people they are nonetheless real.

According to one expert, "The possibility of a food allergy should be considered in a child with constitutional or generalized signs of easy fatiguability, irritability, insomnia, poor work in school or intermittent headaches and stomach aches. These children oftentimes find it difficult to get along with their siblings or peers. Dislike of a food may be a whim, but should be regarded as significant until proven otherwise."⁸

Therefore, the answer to the first question is "yes", there are some food additives that cause reactions in sensitive persons that resemble hyperactivity. Does it then logically follow that the elimination of additives in the diet of hyperactive children will cause a reduction of these types of symptoms?

Since 1973, over a million dollars in research has been spent in testing out Feingold's hypothesis. An Advisory Council established by the Nutrition Foundation and the Interagency Task Force established by the National Institute of Health, the Food and Drug Administration, and the National Education Association quickly recognized the inadequacy of Feingold's research. None of the children studied had been treated under double-blind conditions of the sort required for clinical trials and even Feingold had to admit to the placebo effect in the design of his study. For example, when a child is placed on the Feingold diet, it's mandatory that the entire family be placed on the diet. Obviously, the child's status in the family changes when he or she becomes the dominant member of the family.⁹

When double-blind studies were conducted under very controlled conditions, only 3 out of 90 children showed even minor insignificant differences. Challenge studies, where food dyes equalling 26 mg/day were given to children, showed that only 3 out of 190 children showed any change in behavior. In summary, while a few (less than 2%) of

children might show some behavioral changes, it is nowhere near the 50% cited by Feingold.¹⁰

An August 1983 review in the Journal of the Dietetic Association made the following recommendations regarding Feingold's diet:

1. There is no indication for the continuation of high priority, specially funded programs for investigation in this area.
2. There is no need for changes in public policies in regard to the use of artificial food colorings by industry on the basis of behavioral problems.
3. There is no need for symbols on food labels.
4. Since there is no harmful effect from using this diet, and since the nonspecific placebo effects are frequently beneficial to the families, there's no reason to discourage families that wish to pursue this type of treatment as long as they continue with other types of treatment.¹⁰

What are some suggestions for parents of excitable, rambunctious, unruly children? First examine some other factors such as lack of sleep, overstimulation, too much TV, attention-getting and lack of exercise. Once these are eliminated, check the diet. Any child switched from high sugar, high refined food, nutrient dilute diet to one with nourishing wholesome foods should show improvement. If hyperactivity continues, see a clinician.⁵

Sugar and Behavior

More than any other issue, I have probably heard the most from school personnel in the past 3 months about the effects of sugar on childrens' behavior.

The issue received quite a bit of publicity several years back when consumers started protesting about the advertising of high sugar foods to the young consumer..

A study in Chicago in 1975 on 4 stations revealed that in a one week period of time there were 2,143 food commercials scheduled. At least 49% of these were "poor food choices". It was estimated that an American child sees 10,000 commercials per year and that at least half were for sugary foods. Hundreds of millions of dollars are spent in an

effort to sell these foods to children at an age when they are most easily influenced.¹¹

As of 1981, no significant scientific research had been done on sugar and hyperactivity.¹² Certainly in looking at the amount of sugar in our childrens' diet we need to look at:

1. The huge amounts of sugar consumed (an average of 120 pounds each year with 80 of these from hidden sources.)
2. Displacement of other essential nutrients when sugar becomes a major component of the diet and consequent health status or changes in behavior.
3. Role of sugar in dental caries.
4. Contribution of calories from sugar to our diet.

However, looking at the sugar issue, I feel that there is alot of misinformation floating around on this topic and we need to be particularly aware of some of the more biased information.

For example, back in the early 1980's a television show, viewed by millions showed school children who ate foods high in sugar as noisy, hyper, and uncontrollable. Any researcher would have cited numerous confounding variables to some of this anecdotal evidence: fatigue, residual excitement, etc. The American Council on Science and Health has expressed disappointment in the popular press for giving such uncritical coverage to the blaming of sugar.¹²

Sugar and delinquent behavior is one of the topics now receiving alot of coverage in the popular press. One magazine Prevention, printed a story in the Octobers' 1983 issue about the Tidewater Detention Home, in Chesapeake and Virginia Beach, where a program was undertaken to reduce the sugar intake of the 276 juveniles in the facility. This was done by taking the following steps:

1. All canned fruits packed in syrup were rinsed in cold water before consumption.
2. Soft drink mixes and lemonade were replaced with fruit juices.
3. Iced tea was served unsweetened.
4. Soda machines were replaced with fruit drink machines.
5. Jelly and cinnamon sugar were eliminated from the diet.
6. Sugar was removed from tables and replaced with honey.
7. Molasses was substituted for sugar in recipes.
8. Breakfast cereals high in sugar were eliminated.
9. Parents were asked to refrain from sending foods with large amounts of sugar.
10. Candy, cake, etc. were eliminated and replaced with fresh fruits, peanuts, coconut, carrots, cheese, etc.¹³

According to Prevention, this resulted in antisocial behavior decreasing 48%, 77% fewer cases of theft, an 81% decrease in assaults, a 55% decrease in refusal to obey orders, and a 29% drop in aggressive behavior. It was stated that this was a blind study, that staff and children were uninformed regarding reductions taking place.

While these figures sound impressive, there are several problems with this study. For example, a total of 24 boys participated throughout this period while other children came and went during the study. There was no objective measure of the amount of sugar in control or "reduced" diet (i.e. each child had access to honey on the table rather than sugar.)

The May/June 1983 issue of Nutrition Today contained a critical review of the literature to date on this topic. Their research on reactive hypoglycemia, food additives, and dietary inadequacies and excesses failed to find credible evidence to suggest that any of these are major contributors to delinquency. Since nutritional approaches to the management and prevention of delinquency are not inexpensive and may carry potential

risks, their feeling was that there was no scientific basis for policy changes. They call the theories about a relationship between diet and delinquency a "pseudoscience".¹⁴

Caffeine and Behavior

Probably the area where the relationship between diet and behavior is strongest is in the area of caffeine. There is good evidence that the amount of caffeine consumed in several glasses of tea or cans of coke can cause jumpiness and increased motor activity in children. Since the effects of caffeine are dependent on body weight, the younger the child, the greater the effect.

To quote Environmental Nutrition (Volume 2, Number 6, September - October, 1979) "Children and adolescents who consume great quantities of caffeine-containing soft drinks may complain of uneven heartbeat and insomnia. Since the effect of caffeine is dependent in part on body weight, 12 ounces of cola may exert the same effect on a young child as 4 cups of coffee do on an adult."¹⁵

The FDA Consumer cites similar central nervous system effects (October 1980). "Caffeine is a drug and it acts as a stimulant to the central nervous system, although it does not effect all people the same way. If consumed in large enough doses, it can cause insomnia, nervousness, irritability, anxiety, and disturbances in the heart rate and rhythm. It also seems to have an effect on coronary circulation, blood pressure, the diameter of the blood vessels and secretion of gastric acids. Around 10 grams of caffeine, as much as might be found in 70 to 100 cups of coffee, can be fatal. Its long term effects on people are not clearly known."¹⁶

Because of the mounting evidence regarding the effects of caffeine, the FDA has proposed taking caffeine from its GRAS ("generally recognized as safe") list. It has already changed its regulation that caffeine must be added to pepper and cola-type products, as witnessed by the large amounts of caffeine-free products on the market.¹⁶ For this reason the Virginia School Lunch Program prohibits the sale of caffeinated drinks in our schools.

Which brings us to the School Lunch Program in Virginia.

We consider the school lunch . . . a remedy.

The National School Food Service Program

The Federal lunch program was established in 1946 to provide children with balanced meals to safeguard their health and give training in nutrition education. The lunch program requires that the schools:

1. Serve lunches that meet or exceed the minimum nutritional requirements.
2. Serve meals without cost or at a reduced price to those children who cannot afford to pay for them.
3. Operate a nonprofit organization.
4. Use, as far as practical, USDA-donated foods.
5. Keep proper records as required by USDA.
6. As of 1980, involve students and parents.¹¹

The school lunch pattern was formulated by USDA nutritionists from the RDA's established by the Food and Nutrition Board. These allowances are reviewed every five years and changed, if necessary, to reflect the eating habits and needs of the American population. Special attention is given to the U. S. Senate subcommittees' recommendations on keeping fat, sugar, and salt at moderate levels in school lunches and increasing the intake of carbohydrates in the form of vegetables, fruits, whole grain or enriched breads - and whole grain or enriched rice, macaroni, or noodles.

Several years ago, when child nutrition programs, including the School Lunch Program started taking large cuts in funding, local school food service programs, fearing that they would no longer be able to survive financially, began to sell many items a la carte -sandwiches, hamburgers, ice cream, cookies, etc. Some schools have now installed salad bars and potato bars as well.

With a la carte selections, most school divisions are finding themselves able to survive quite comfortably. Critical observers see the children going through the line and selecting only fast food items and blame this on the school food service in that cafeteria. School food service personnel will argue that they cannot help it if the children don't select the "fruits and vegetables" they have to offer - that parents are responsible for teaching them how to select their foods. One thing is for certain, the more financially stable food service programs are the ones offering innovative ideas, such as salad bars, potato bars, which are emerging as the fast food industries' response to the need for healthier "convenience foods".

"Fast foods" and convenience foods are here to stay, as is "a la carte" in the schools. The key is teaching our children how to select appropriate foods for themselves. This we only do successfully by example.

We put our children at risk when we ourselves are at risk with poor health habits, poor nutrition and poor attempts at risk management.

As indicated by this talk, research doesn't tell us that there is one answer or one culprit in inducing behavioral changes in our children but looking at the entire picture; diet, exercise, and healthful habits can certainly have an impact on how our children perform in school.

REFERENCES

1. Read, M. S., Malnutrition, Learning and Behavior, Journal of the American Dietetic Association, 63:379, 1973.
2. Richardson, S. A., Burch, H. G. and Hertug, M. E. "School Performance of Children Who Were Severely Malnourished in Infancy" American Journal of Mental Deficiency, 1973.
3. Zimmerman, R. R., Strobel, D. A., Steere, P. and Geist, C. R.; "Behavior and Malnutrition in the Rhesus Monkey", in Rosenblum, L. ed: Primate Behavior, Vol. 4, New York: Academic Press.
4. Moore, Carl V.; "Iron", in Modern Nutrition in Health and Disease, ed. R. S. Goodhart and M. E. Shils, Philadelphia: Lea and Febiger, 1976.
5. Hamilton, E. M. and Whitney, E. N.: Nutrition Concepts and Controversies, Controversy 13: Hyperactivity, pp. 449 - 454, West Publishing.
6. Feingold, Benjamin F., Why Your Child Is Hyperactive, New York: Random House, 1975.
7. Nagy, M. "Monosodium Glutamate and the 'Chinese Restaurant Syndrome'", Journal of the American Medical Association, 225:1665, 1973.
8. Fontana, V. J. and Moreno-Pagan, F., "Allergy and Diet" in Modern Nutrition in Health and Disease ed. R. S. Goodhart and M. E. Shils, 6th edition, Philadelphia, Lea and Febigers, pp. 924 - 940, 1976.
9. National Advisory Committee on Hyperkinesia and Food Additives, Final Report to the Nutrition Foundation, October, 1980.
10. Lipton, Morris A., Mayo, James F., "Diet and Hyperkinesia - an Update" Journal of the American Dietetic Association 83:132, 1983.
11. "Teaching About Nutrition", Colorado Department of Education, C. M. Frazier, Commissioner.
12. Hamilton and Whitney, Controversy 4A: "Sugar", pp. 101 - 106.
13. Schoentheler, Stephen J., "Sugar Goes on Trial: Indicted for Causing Crime" Tidewater Detention Home, Chesapeake and Virginia Beach, Virginia, Unpublished paper, September, 1982.
14. Gray, Gregory E. and Gray, Lorraine K., "Diet and Juvenile Delinquency" Nutrition Today, May/June, p. 14, 1983.
15. "Caffeine - A Healthy Habit", Environmental Nutrition, 2:6, 1979.
16. Lecos, Chris, "Caution Light on Caffeine", FDA Consumer, p. 6, October, 1980.